

Amendments to the claims are presented herein by presenting a complete set of pending claims, as amended, in clean form. Also, an Appendix entitled "Version With Markings to Show Changes Made," showing the current amendments to the claims is attached hereto.

Please amend the above-identified application as follows:

IN THE CLAIMS:

Please replace the previous version of the claims with the following clean version, wherein claims 1-4, 17, and 23-26 incorporate new amendments thereto.

D' 1. (Twice Amended) A driving apparatus for driving a piezoelectric element serving as a driving source of an actuator comprising:
a waveform generator for generating a waveform signal varying over time;
a first driver for generating a first driving signal, wherein the first driving signal has a maximum voltage smaller than a voltage of inversion of polarization of the piezoelectric element and has a first waveform derived from the waveform signal, the first driver being coupled to provide the first driving signal to the piezoelectric element in the polarization direction of the piezoelectric element; and
a second driver for generating a second driving signal, wherein said second driving signal has a maximum voltage smaller than the voltage of inversion of polarization of the piezoelectric element and has a second waveform derived from the waveform signal, the second driver being coupled to provide the second driving signal to the piezoelectric element in a direction opposite to the polarization direction;
wherein the first waveform is a polygon waveform and the second waveform is a polygon waveform.

2. (Twice Amended) A driving apparatus in accordance with claim 1, wherein the second waveform is an inversion of the first waveform.

[3. (Canceled) A driving apparatus in accordance with claim 1, wherein the first and second waveforms are sine waves.]

4. (Once Amended) A driving apparatus in accordance with claim 1, wherein the first and second waveforms are sawtooth waves in which the inclination in a rising portion is different from that in a falling portion.

5. A driving apparatus in accordance with claim 1, wherein the first driver and the second driver respectively include an amplifier for amplifying the signal from the waveform generator.

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6. A driving apparatus in accordance with claim 1, wherein the actuator is an impact type actuator comprising a first unit with the piezoelectric element and a second unit slidably held on and relatively movable against the first unit.

17. (Thrice Amended) A driving apparatus for driving a piezoelectric element serving as a driving source of an actuator comprising:

a first driver for applying a first time varying driving signal having a first waveform to the piezoelectric element in a polarization direction thereof; and

a second driver for applying a second time varying driving signal having a second waveform to the piezoelectric element equal to or smaller than a voltage of inversion of polarization of the piezoelectric element in a direction opposite to the polarization direction;

wherein the first waveform is a polygon waveform and the second waveform is a polygon waveform.

18. A driving apparatus in accordance with claim 17 further comprising an electric power supply for supplying electric power to the first and second drivers.

19. A driving apparatus for driving a piezoelectric element serving as a driving source of an actuator comprising:

a first driver for applying a first driving signal to the piezoelectric element in a polarization direction thereof;

a second driver for applying a second driving signal to the piezoelectric element equal to or smaller than a voltage of inversion of polarization of the piezoelectric element in a direction opposite to the polarization direction;

an electric power supply for supplying electric power to the first and second drivers; and

a waveform generator for generating a time varying signal, wherein only the first driver applies the first driving signal corresponding to the waveform of the time varying signal when the time varying signal is larger than a predetermined level; and

wherein both of the first and second driving signals correspond to the time varying signal when the time varying signal is smaller than the predetermined level.

20. A driving apparatus in accordance with claim 19, wherein the first and second driving signals are 0V when the time varying signal is equal to the predetermined level.

21. A driving apparatus in accordance with claim 19, wherein the waveforms of the first and second driving signals are sine waves.

22. A driving apparatus in accordance with claim 19, wherein the waveforms of the first and second driving signals are sawtooth waves in which the inclination in a rising portion is different from that in a falling portion.

23. (Thrice Amended) A method for driving an actuator having a piezoelectric element serving as a driving source characterized by:

a first driving signal having a first waveform and having a maximum voltage smaller than a voltage of inversion of polarization of the piezoelectric element is applied to the piezoelectric element in a polarization direction of the piezoelectric element; and

a second driving signal having a second waveform and having the same voltage but the inverted polarization is applied to the piezoelectric element in a direction opposite to the polarization direction of the piezoelectric element;

wherein the first waveform is a polygon waveform and the second waveform is a polygon waveform.

24. (Twice Amended) A method in accordance with claim 23, wherein the second waveform is an inversion of the first waveform.

25. (Canceled) A method in accordance with claim 23, wherein the first and second waveforms are sine waves.

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26. (Twice Amended) A method in accordance with claim 23, wherein the first and second waveforms are sawtooth waves in which the inclination in a rising portion is different from that in a falling portion.

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27. (New) A driving apparatus for driving a piezoelectric element serving as a driving source of an actuator comprising:

a waveform generator for generating a waveform signal varying over time;

a first driver for generating a first driving signal, wherein the first driving signal has a maximum voltage smaller than a voltage of inversion of polarization of the piezoelectric element and has a first waveform derived from the waveform signal, the first driver being coupled to provide the first driving signal to the piezoelectric element in the polarization direction of the piezoelectric element; and

a second driver for generating a second driving signal, wherein said second driving signal has a maximum voltage smaller than the voltage of inversion of polarization of the piezoelectric element, has a maximum voltage approximately equal to the maximum voltage of the first driving signal and has a second waveform derived from the waveform signal, the second driver being coupled to provide the second driving signal to the piezoelectric element in a direction opposite to the polarization direction.

28. (New) A driving apparatus in accordance with claim 27, wherein the second waveform is an inversion of the first waveform.

29. (New) A driving apparatus in accordance with claim 27, wherein the first and second waveforms are sine waves.

30. (New) A driving apparatus in accordance with claim 27, wherein the first and second waveforms are sawtooth waves in which the inclination in a rising portion is different from that in a falling portion.

31. (New) A driving apparatus in accordance with claim 27, wherein the first driver and the second driver respectively include an amplifier for amplifying the signal from the waveform generator.

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32. (New) A driving apparatus in accordance with claim 27, wherein the actuator is an impact type actuator comprising a first unit with the piezoelectric element and a second unit slidably held on and relatively movable against the first unit.

33. (New) A driving apparatus for driving a piezoelectric element serving as a driving source of an actuator comprising:

a waveform generator for generating a waveform signal varying over time;

a first driver for generating a first driving signal, wherein the first driving signal has a maximum voltage smaller than a voltage of inversion of polarization of the piezoelectric element and has a first waveform derived from the waveform signal, the first driver being coupled to provide the first driving signal to the piezoelectric element in the polarization direction of the piezoelectric element; and

a second driver for generating a second driving signal, wherein said second driving signal has a maximum voltage smaller than the voltage of inversion of polarization of the piezoelectric element and has a second waveform derived from the waveform signal, the second driver being coupled to provide the second driving signal to the piezoelectric element in a direction opposite to the polarization direction;

wherein the second waveform is an inversion of the first waveform.

34. (New) A driving apparatus in accordance with claim 33, wherein the first and second waveforms are sine waves.

35. (New) A driving apparatus in accordance with claim 33, wherein the first and second waveforms are sawtooth waves in which the inclination in a rising portion is different from that in a falling portion.

36. (New) A driving apparatus in accordance with claim 33, wherein the first driver and the second driver respectively include an amplifier for amplifying the signal from the waveform generator.

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37. (New) A driving apparatus in accordance with claim 33, wherein the actuator is an impact type actuator comprising a first unit with the piezoelectric element and a second unit slidably held on and relatively movable against the first unit.
